US Army Medical Research and Materiel

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Low-backscatter Aperture Structure

This invention is a method and a system that includes a low-backscatter aperture structure. An aperture is an opening through which light energy can pass. Apertures are used to either control or to measure light as it travels through a system. They may be used in various optical systems to define a field-of-view (such as in telescopes and microscopes), define beam convergence/divergence and uniformity, or to control the size of an image. The invention could include a camera, an optical communications system, an imaging system, a test system, and a measurement system. The system may also include one or more aperture-ingress-side surfaces and one or more aperture-egress-side surfaces.

The invention is based on the assumption that the backscattering of light from aperture-defining structures may create measurably significant noise. The backscattering is primarily the result of light rays obeying the law of reflection. The more irregular the reflective surface, the more diffuse the reflection becomes, resulting in measurement errors and noise. The invention substantially decreases optical noise below that manifested in related-art systems.

For miniature optical systems, fixed apertures (*e.g.*, those [illegible] specific shaped and sized aperture openings) would be the standard implementation. However, the inventors have surmised that optical bench applications using low-backscatter aperture structures could be made [illegible] if the low-backscatter apertures were fabricated to provide replaceable openings. A study has shown the V-shaped low-backscatter aperture structure provides lower optical noise than that arising from related-art apertures.

Features and advantages:

- **Increases signal-to-noise ratio in optical trains**
- **Significantly reduces the need for an aperture "standoff" requirement**
- **More compact optical systems without increased errors and noise**
- **Could use in telescopes, micro-scopes, cameras, optical [illegible]**

Patent Status

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